

Devices and methods for multiplexing liquid in biosensor micro-chambers

Market sector: point-of-care diagnostics, biosensors

Type of opportunity: licensing and/ or co-development

Scope of the problem

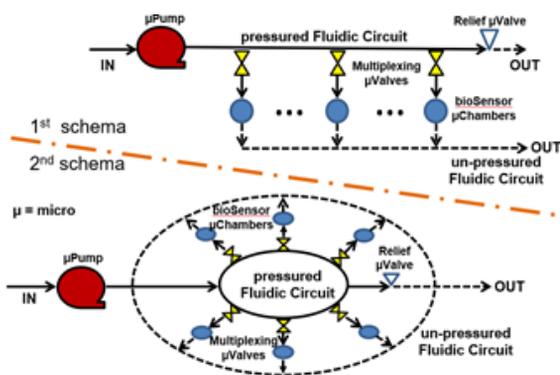
Point-of-care (PoC) diagnostics is commonly based on portable, inexpensive, and user-friendly sensor platforms that allow sensitive, robust, and real-time detection of biotargets. The accuracy and reliability of disease diagnostic protocols can be improved by analyzing multiple biomarkers and using multiplexed assays. Multiplexing is a decisive technological breakthrough since it allows the multivariate analysis of large numbers of samples from different patients. This, in turn, results in improved prognostic determination of the role of biomarkers in specific diseases.

One example of new PoC devices are the continuous flow biosensors devices in which micro-fluidic systems are present through different liquids are automatically inserted in the biosensor micro-chamber. Flooding a biosensor micro-chamber with different liquids is a natural and necessary operation within the biosensors devices both to perform the biorecognition event and to wash/regenerate, i.e. to restore, the biosensor for subsequent analysis. Nevertheless, in such multi-analyte biosensor applications there is the issue that different amounts of the sample liquid enters the biosensor micro-chambers. Another problem of the conventional continuous flow biosensor applications is that it is very difficult to supply the biosensor micro-chambers with a sufficiently precise low flow rate of liquid. In this context, it is necessary to achieve new fully operative biosensor platforms to surpass the above challenges.

Patient need addressed: Multi-analyte detection for specific diseases

Our innovation:

- New methods for supplying a functional liquid to biosensor micro-chambers in biosensor devices for multiple-analyte analysis.
- The amount of functional liquid supplied to each biosensor micro-chamber can be independently controlled and can flood at least one biosensor micro-chamber in a functional time period at an accurate very low flow rate by using the fluidic circuit.
- The flow of the functional liquid is selectively inlaid in the biosensor microchambers by one or more micro-valves controlled by an injection control unit so that the flow in each biosensor micro-chamber can be independently controlled with great accuracy.
- It is possible to multiplex a functional liquid to a plurality of biosensor micro-chambers accordingly to a pulsating flow mode.
- it is possible to supply within a functional time period each biosensor micro-chamber with an identical amount of functional liquid and the biosensor behaves as in the continuous flow mode with very low flow rate.



Competitive advantages: cost-effective device, that provide fast, simultaneous and real-time responses. A great reduction of the total flow of the functional liquid. Sensitive and accurate performance for multiple-analyte analysis that meet clinical requirements.

Market size/ opportunity: The global point-of-care diagnostics market was valued at USD 21.40 Billion in 2016 and is expected to reach USD 38.13 Billion by 2022 (Markets and Markets, 2018). The *in vitro* diagnostic market is expected to be worth \$55.4bn worldwide by 2020 (Marketline, MLAI0002-073, 05/2017).

Intellectual property

International patent application (PCT), priority date: May 11, 2017